Circular 13 O
15,000—June, 1913.

Ontario Department of Education

BULLETIN NO. 8

(Being a Revised Edition of Bulletin 134 of the Ontario Department of Agriculture)

JUNE, 1913

Agricultural Education

Nature Collections for Schools

I. A Nature Study and Agricultural Note Book.
II. Plant Collections.
III. Insect Collections.
IV. Historical and Miscellaneous Collections.
V. Bulletin Board and Museum Cabinet.
VI. School Fairs and Children's Competitions.

RURAL SCHOOL FAIR, AMELIASBURG TP., PRINCE EDWARD CO., 1912

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1913

NOTE:—(1) One copy is sent to the Principal of every graded school; it is requested that he circulate it amongst his staff.
(2) Two copies are sent to every rural school. One copy is for the teacher and should be retained in the school. The other copy is for use in the School Section. PLEASE KEEP IT IN CIRCULATION.
(3) Teachers leaving their schools in June should see that all Bulletins are gathered together and left safely where successor may secure them.

EXPLANATORY

"Hints on Making Nature Collections in Public and High Schools" was first issued by the Ontario Department of Agriculture in 1904 as Bulletin 134. It was prepared by the late Dr. W. H. Muldrew, Dean of Macdonald Institute. In 1906 a revised edition was published. In reprinting it again in 1913 as one of the series of Agricultural Education Bulletins, published by the Department of Education, its identity as Bulletin 134 of the Department of Agriculture should be recognized.

THE NATURALIST'S FOUR CHIEF QUESTIONS

From "Memorandum on Nature Study and Teaching of Science in Scottish Schools," published by Scotch Education Department.

It may be useful to teachers to point out that the naturalist asks four chief questions—the answers to which, all very important, are unified into a science of life-lore or biology.

The first question is—"What is this?" an inquiry into form and structure. What is this living creature in itself and in its parts? What is it as we see it with our own lenses only, and as we see it when we put other lenses in front of ours? What is it as a thing by itself and when compared with its fellows and kindred?

The second question is—"How does this act?" an inquiry into habits and functions. How does this living creature behave as it does? What is its business? How does it keep a-going and set other creatures like itself a-going? How does it get on? What is the "particular go" of it?

The third question is—"Whence is this?" an inquiry into development and history. Where did this living creature come from? How did it begin? What was it like when it was young? What are the chapters in its growth and life history? What is known of the history of its race?

The fourth question is—"How has this come to be as it is?" an inquiry into causes. What factors have led to this living creature being what it is, where it is, as it is; in short, what have been the factors in its evolution?

It need hardly be said that these are not questions for children. They are the fundamental questions of the science of biology, which is not for children. But they are stated here because they help greatly to keep our own minds—as teachers—in good order.

The Boy and the Insect.

PURCHASE OF SUPPLIES

The Students' Co-operative Supply Department

of the

Ontario Agricultural College, Guelph

will be prepared to furnish Schools with such botanical and entomological supplies as are mentioned in this Bulletin.

The Insect and the Boy.

INTRODUCTORY

Value of Collections.—As a centre of interest for the Nature and Agricultural Studies of a school, there is nothing more helpful than a collection of suggestive things from the outdoor world. The value is, however, in the *making* and the *using* rather than in the *keeping,* and this bulletin is intended as a guide to teachers and pupils in beginning such work. We need hardly say that collections, like books and other tools, are but the *means,* while the *end* is to be found in the interest that is aroused and the thought that is stimulated.

It is not to be expected that all of these suggestions will be practicable in our schools at once. Teachers have many duties to take up their time and attention, and Nature Study and Agriculture must be content with small beginnings, until they can show themselves worthy of places with the older subjects of the school-room. The important thing is to make a beginning, however small, and then to grow with the work as results may warrant.

In recent years, local fairs have given prizes to schools for nature collections, and in some places excellent sets have been shown. The weakest point with these has been want of method and uniformity in the preparation of exhibits, which should follow some general system. It is very probable that such competitions will be encouraged more and more in future years in connection with the larger exhibitions as well as at the smaller fairs, and it is therefore important that there should be some general standard for the guidance of teachers and scholars.

I—A NATURE STUDY AND AGRICULTURAL NOTE BOOK

Outdoor nature is full of interesting things and events. Youthful eyes and ears are quick to see and hear, and youthful minds are quick to think. Suppose we help them to keep a record of the happenings of this outside world.

Class Note Book.—There are two kinds of observation books that might be kept; one of a general character, kept by the whole school and put into the school library from year to year as a record of the school section's history; in this different scholars or classes might, under the teacher's supervision, make the records from day to day or week to week. Such a book would become of more general interest and value the older it became.

Pupil's Note Book.—The other kind is for the pupils themselves. A simple note-book and a pencil supply the needed outfit; five minutes in morning or afternoon supplies the time; the children will gladly supply the ideas. A brief discussion, a few suggestive questions, and a permanent record will form a worthy lesson to begin the day's work, and will not lose its effect. Is there a teacher who will not do as much? Give date, place, and name of observer with all needed particulars. Let older pupils make their own entries, but give equal credit to the earliest efforts.

What to Observe.—What things may find a place in these Nature Notes? All things of interest to children or to the community, in the world of Nature. We suggest a few classes of items from the endless variety supplied by the changing seasons. The aim will be to form the habit of observation rather than to collect information, but the facts will have a value and interest of their own.

A. First Things of the Season: the return of the common birds, as robins, crows, and bobolinks; the northern or southern flight of geese, ducks, and gulls; the appearance of hibernating animals, as the woodchuck, chipmunk, snake, and bat; the awakening of the frogs; the leafing and flowering of the trees, the opening of the wild flowers; the re-appearance of insects, as butterflies, mosquitoes, potato beetles; the coloring and falling of leaves in Autumn.

B. Events of Interest: frost, snow, rain, hail, rainbows, new and full moon, eclipses; the beginning and end of sleighing; plowing, sowing, and planting, haying, harvesting, potato-digging; making maple-sugar; going fishing or berry-picking; the birds building nests or feeding their young; crows pulling corn or eating grasshoppers; the young of wild or domestic animals; the swarming of bees; use or harm of birds and insects; tracks of animals in winter.

C. Histories of Growth: descriptions and drawings showing changes from day to day; notes on the condition of some chosen development, as, for example: (a) A plant from a seed. (b) A tree, from bud to leaf and flower to fruit. (c) A bird's or wasp's nest. (d) A field of grain or roots.

Records of things like these would form a very interesting book. The inspector would be glad to see it. Next year it would be doubly valuable for comparison. A careful summary would be welcomed by any good local paper. It would add much to an exhibit at the autumn fair, for it would show thinking as well as collecting, and the very best one in the Province would make an excellent bulletin for the schools.

Uniform and Permanent Books.—The form of this note-book should be carefully considered. It would be well to select a book of standard size, with a good cover and good paper. If a *cheap* book is used there is likelihood of careless work being done in it and little regard for making it a permanent record. If a standard size is used, the pupil may have a neat set of yearly volumes at the close of his school days; a set of books, dissimilar in size, binding and quality of paper would not induce the same pride in his work.

Loose-Leaf Note-Book Recommended.—Perhaps the best form would be a loose-leaf system. The pupils could make their own covers for it out of cardboard and cover it with linen as an exercise in constructive work. If the covers are made 7 in. x 10 in. they will allow the keeping of all standard size government bulletins and reports along with the pupil's notes. The bulletins are about 6½ in. x 9½ in. A school supply of paper, ready cut and punched, could be kept at a very small cost; for art work and plant mounting a good manila paper would answer very well, and for written work a ruled white paper would be required; for paper-folding paper may be cut from waste wrapping paper. A paper punch would be of great service.

Taking Notes.

This scheme has many advantages over the bound book plan: it is economical; it enables the teacher to examine the work with facility; it allows an easy replacement of a poorly executed exercise; it permits the pupil to arrange the pages systematically under subjects; it brings all the co-related topics in Geography, Art Work, Nature Study and Agriculture into a natural grouping; it assists in an easy display of pupils' work about the schoolroom; and finally it gives each child a book full of pleasant recollections, to keep on his book shelf in after life.

Pupils' Records Required in Agriculture.—In schools taking up the subject of Agriculture under the regulations of the Department of Education, the pupils in the higher classes are required to keep systematic records of the instruction received and the work carried out practically in the school or home gardens. The kind of book described above is recommended.

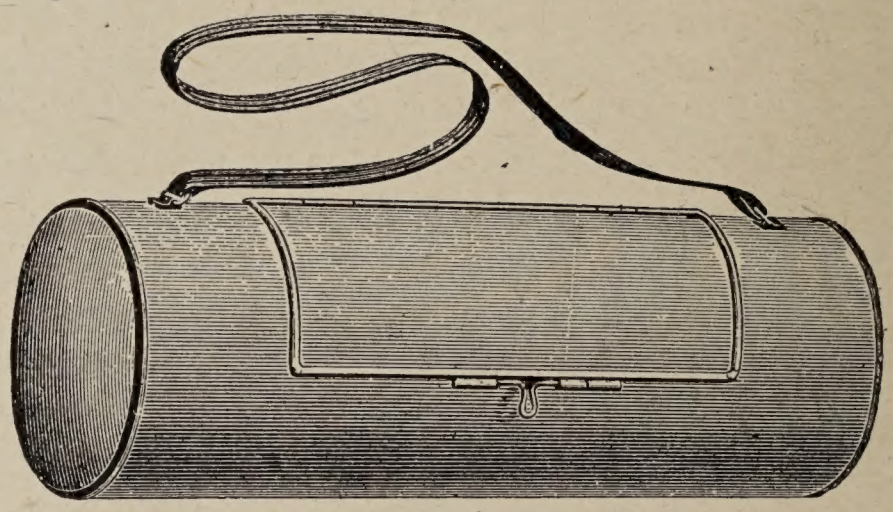
Phenological Observations.—The scheme of observation work practised in the Nova Scotia schools is worthy of note. It has been the basis of their Nature Study work for several years. The observations are on *the first appearance* of flowers, birds, etc., and are known as "phenograms," "phenological observations." A few examples are given here as suggestions. Pupils could rule pages of their note-books and keep similar records for Ontario. If the records were made on larger sheets they could be kept on the school bulletin board and compared year after year.

	When First Seen	When Becoming Common
FLOWERING OF WILD PLANTS.		
1. Willow catkins shedding pollen	.....	.....
2. Aspen shedding pollen	.....	.....
3. Blood-root	.....	.....
4. Hepatica	.....	.....
5. Strawberry	.....	.....
6. Dandelion	.....	.....
FLOWERING OF CULTIVATED PLANTS, ETC.		
7. Cherry	.....	.....
8. Plum	.....	.....
9. Apple	.....	.....
10. Lilac	.....	.....
11. Red Clover	.....	.....
12. Potato	.....	.....
FARMING OPERATIONS, ETC.		
13. Plowing begun	.....	.....
14. Sowing begun	.....	.....
15. Planting of Potatoes begun	.....	.....
16. Shearing of Sheep	.....	.....
17. Hay Cutting	.....	.....
18. Grain Cutting	.....	.....
19. Potato Digging	.....	.....
METEOROLOGICAL PHENOMENA.		
20. Opening of (a) Rivers, (b) Lakes without currents	.....	.....
21. Last Spring Frost (a) "hard" (b) "hoar"	.....	.....
22. Water in Streams, Rivers, etc., (a) highest (b) lowest	.....	.....
23. First Snow (a) to fly in air, (b) to whiten ground	.....	.....
MIGRATION OF BIRDS, ETC.	SPRING First Seen	FALL Last Seen
24. Wild Geese migrating	.....	.....
25. Song Sparrow	.....	.....
26. American Robin	.....	.....
27. Kingfisher	.....	.....
28. King Bird	.....	.....
29. Bobolink	.....	.....
30. Piping of Frogs	.....	.....

II—PLANT COLLECTIONS: FLOWERS, SEEDS, FRUITS, WOODS

Value of Mounted Plants.—A flower that has withered and dried in the usual way is useless; it has lost even the likeness of its growing self, and has become brittle, faded and crumpled. But if dried instead between sheets of porous paper under heavy pressure it retains much of its original color and strength in a form that is very convenient for examining as well as for preserving and exhibiting. When thus prepared and mounted on a suitable card with a proper label it forms a useful, permanent specimen for study or comparison.

Materials Required for Work.—To prepare plants properly in this way, the following will be needed: Drying paper (carpet felt or coarse porous paper), sheets of tea-paper (or smooth newspaper leaves), two pieces of smooth board 12 inches x 20 inches; a few weights (suitable stones or bricks of about 10 lbs. each will answer); standard size mounting paper, in sheets 11½ inches x 16½ inches; liquid glue or strips of gummed paper; labels showing botanical and common name, date, place and collector; a collecting box or vasculum, and a note-book.



A Collecting Box or Vasculum.

Drying Process.—The entire plant, as far as possible, should be in the collection. When this is impossible, as with large plants, trees and shrubs, branches with leaves, or leaves and flowers, should be collected and preserved. In drying plants, care should be taken to secure the specimen (free from outside moisture) without breaking any portion of it. It should be spread very carefully between two leaves of tea-paper with sheets of drying paper above and below. Many plants may be placed one above the other, separated by drying paper, and pressed at the same time by weights on the upper board. When a plant is placed thus to be dried, a note should be put with it, stating its name, the date of collection, the locality where it was collected, and the collector; for one must not trust too much to memory in these matters. The collection will very likely grow rapidly and experience will soon show the need for keeping notes of every plant collected. Carpet-felt makes excellent drying paper, and can be obtained at most dry goods stores for about five cents a square yard. Instead of tea-paper, ordinary newspaper, cut up into convenient sizes, may be used. The secret of drying plants well is to change the dryers frequently. The more water the plant contains the more frequently should the dryers be changed, and in some cases this might be done daily.

Mounting.—Each plant should have a separate sheet to itself and all the mounting paper should be of the same size, color and quality. The standard herbarium mount is a sheet of white *ledger* paper, 11½ x 16½ inches, but a strong manila paper is better for ordinary collections and much cheaper than the white ledger paper. For a school collection or Fall Fair exhibition this size should always be used; but for a child's collection a smaller sheet to fit the nature study note-book might well be substituted. While it may often prevent the showing of whole plants, it will allow the specimens to be kept more convenienty at home, and, therefore, made of more use. Should a pupil expect to make an extensive collection, the standard sheet should be used.

Before fastening the dried plant to the paper, it should be placed in different positions in order to select the best artistic effect. The neatest fastening is made by putting neat straps of gummed paper *over* the stems *through* small holes in the paper, and fastening at the back. The leaves may be fastened by the application of a *little* mucilage here and there. It is best to have the gummed paper, used for strapping, of the same color as the mount; it may be made by coating some of the mount paper with mucilage and letting dry; the semi-transparent gummed paper used for repairing music answers very well. The straps should be put on neatly and systematically; cut to the same widths and lengths as far as possible, and laid in the same directions.

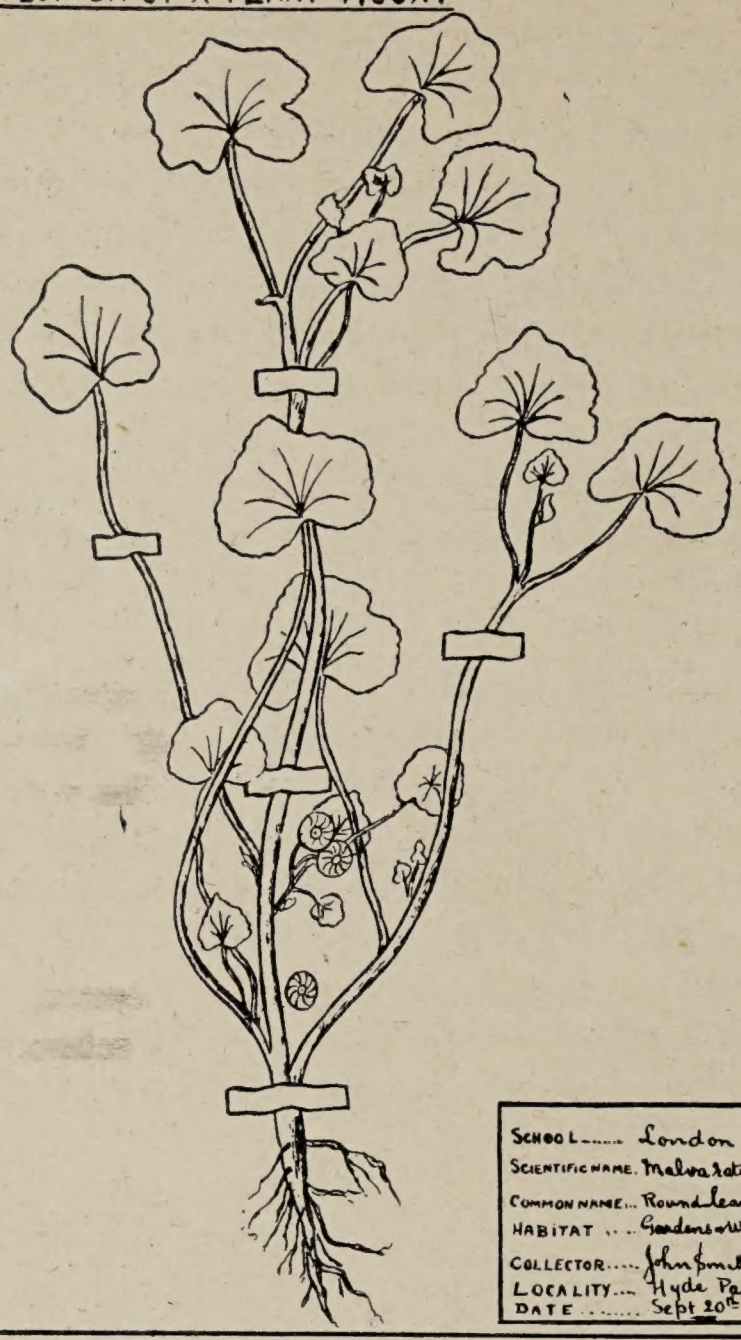
A close tin box or vasculum about 18 inches long and of a shape suitable for carrying by a shoulder strap, is very useful for collecting fresh plants, and may be easily made by any tinsmith.

Collections of Seeds.—For seeds it is necessary to use some means of preventing them being scattered. The small screw-capped glass vials of one drachm capacity are most commonly used. They are best mounted in small wooden boxes with brass clamps or elastic. They can be mounted satisfactorily also on cardboard, covered with glass and passé-partouted. Weed seeds make one of the most interesting and useful collections, but flower and vegetable seeds are also worth collecting. The labelling should be neat and exact. A wrongly labelled specimen of anything is almost worse than useless.

Collections of Fruits.—The dry fruits of trees and shrubs are equally interesting, and may be fastened in the same way, or by means of glue or mucilage, on similar cards. The keys of the maples, the acorns with their cups, the winged fruits of elm, ash, and pine all serve for important lessons on the reproduction of trees and the distribution of their seeds. Many Canadians have never seen the seed of the pine; and many can see no connection between the cones at the summit and the seedlings at the foot of the giant of the forest. A collection of tree seeds carefully mounted and named is an excellent lesson on forestry.

Collections of Wood.—Sections of wood from the various kinds of trees form an interesting and useful collection. These should be prepared in such a way as to show the bark, and two planed surfaces. The size should be 3 inches in length by 1 inch in width, by ½ inch in thickness.

SPECIMEN OF A PLANT MOUNT



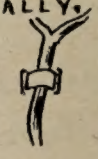
School ..... London C.3.
Scientific name. Malva rotundifolia
Common name... Round-leaved mallow
Habitat ... Gardens & waste places
Collector ..... John Smith
Locality ... Hyde Park
Date ..... Sept 20th 1909.

WHITE LEDGER PAPER, OR MANILA TAG BOARD ARE THE BEST MOUNTING PAPERS

THE SIZE OF THE STANDARD HERBARIUM SHEET IS $11\frac{1}{2} \times 16\frac{1}{2}$ INCHES. BUT FOR SMALL WORKING COLLECTIONS, SHEETS TO FIT PORTFOLIOS MAY ANSWER BETTER

ARRANGE THE PLANT ON THE SHEET NEATLY. ATTACH IT WITH UNIFORM BANDS OF ADHESIVE PAPER. STRIPS OF TRANSPARENT TAPE USED FOR MENDING MUSIC ANSWERS WELL, STRIPS MADE FROM THE MOUNTING PAPER ARE LEAST NOTICEABLE.

AS FAR AS POSSIBLE PLACE THE BANDS HORIZONTALLY. WHEN PUT THROUGH SLITS IN THE SHEET AND FASTENED AT THE BACK, THEY LOOK VERY NEAT INDEED.



PLANTS MAY BE FASTENED ALSO WITH THREAD OR MUCILAGE.

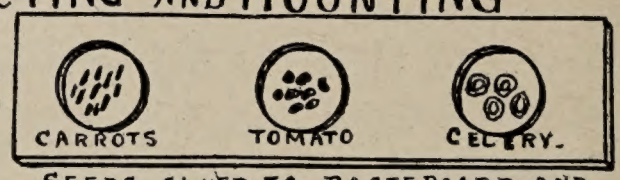
LABELS ARE ABOUT $2\frac{1}{2} \times 4$ INCHES ATTACH THEM UNIFORMLY, SLIGHTLY BACK FROM THIS CORNER. APPLY MUCILAGE ONLY AT UPPER EDGE. IF NOT USING DETACHABLE LABELS, RULE OUT UNIFORM SPACE AND LINES INSTEAD.

SUGGESTIONS FOR SEED COLLECTING AND MOUNTING

I

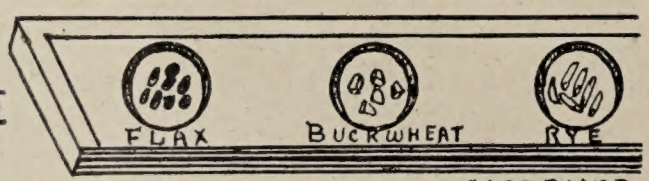
SEEDS GLUED TO PASTEBOARD WITHIN SQUARES OF ATTACHED CARDBOARD

II



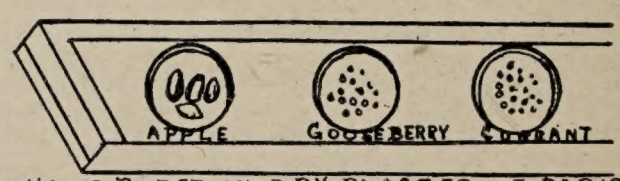
SEEDS GLUED TO PASTEBOARD AND SURROUNDED BY BRASS RINGS

III



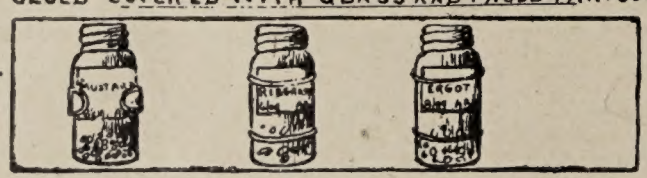
HOLES PUNCHED IN SHEET OF CARDBOARD, THIS PASTED ON ANOTHER SHEET., SEEDS GLUED COVERED WITH GLASS AND PASSE-PARTOUTED

IV



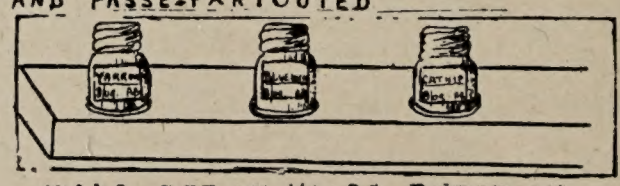
HOLES BORED IN DRY PLASTER OF PARIS PLAQUE. SEEDS COVERED WITH GLASS AND PASSE-PARTOUTED

V



$\frac{1}{8}$ VIALS WITH SCREW CAPS, FASTENED TO HEAVY CARDBOARD WITH BRASS CLAMPS, ELASTIC BANDS OR THREAD

VI



VIALS SET IN HOLES BORED IN WOODEN HOLDER

Such pieces may be easily fastened on heavy cards the same size as those used for pressed plants, and should be labelled in the same way.

It is better to use sections from the body wood of the trees, but this is often inconvenient, and the size given above can be easily secured from a branch without destroying the tree. Similar sections showing the work of insect borers or of woodpeckers may be mounted in the same way and will be very useful.

School Exchanges Within the Empire.—The League of the Empire is an organization having for its general object the affiliation of the schools in different parts of the British Empire. It accomplishes this by arranging for friendly intercourse and the exchange of descriptive letters between pupils; for exchange of school essays, illustrated, if desired, by maps, brush work, snap-shots, or dried specimens of plants; also of other Nature Study material, drawings and art work; of objects of interest for personal or school collections, and of articles for school magazines; also for exchange of information between teachers, regarding time-tables, methods of work and conditions of life in different parts of the world. By this means knowledge of customs, agriculture, industries, education, etc., as are individually needed may be brought within reach of all for their practical use.

It publishes "The League of the Empire Monthly Record," which treats in a general way of imperial matters of interest to the schools. The Record is free to all members and schools paying the annual fee of five shillings.

Applications for membership should be sent to Mrs. Ord Marshall, Hon. Sec., Caxton Hall, Westminster, London, England, enclosing 5s. for the school's membership fee and a school letter to be sent to some other school in that part of the Empire selected.

Apply on a form made out as follows:—

FORM OF APPLICATION.

Name of School .....
Postal address .....
Name of headmaster or mistress .....
Boys' or girls' school .....
Primary or secondary .....
Class from which pupils are mainly drawn .....
.....
Range of pupils' ages, between..... and ..... years.
Part of the Empire with which it is wished to correspond .....

Signature of Applicant .....

Should personal membership be desired by pupils under sixteen years of age, an annual fee of sixpence should be added for each. This entitles them to be placed in correspondence with a pupil of a school in some distant part of the Empire. From many Canadian schools interesting and instructive correspondence and Nature Study interchange are being carried on. Try it for a year.

III—INSECT COLLECTIONS

Insects may be collected at all seasons of the year, but the best time is undoubtedly the summer months. Many collectors find the moths and butterflies most interesting on account of the extreme beauty of their wings; others find greater interest in beetles; still others prefer the study of groups which are not so beautiful to the ordinary observer. Insects of special harm or use, for any reason, are always interesting.

The great majority of the moths must be caught at night, for they rest during the day-time. Most of them are readily attracted to lights, and may be secured by devices such as trap lanterns. Many insects are also attracted readily by sweets, such as sugar or molasses, and if a sweet solution is brushed on the bark of trees, moths frequently gather at such trees after dark and are easily captured.

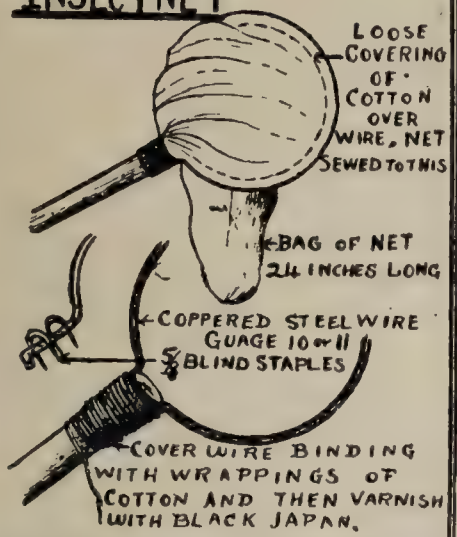
Equipment Required.—The following articles are needful for collecting: Cyanide bottles, one or more; insect pins; cigar boxes or insect cases; spreading boards, different sizes; date and locality labels; larvæ bottles.

Killing Bottle.—The cyanide bottle is needed for killing insects before they can be pinned. This bottle may be made as follows: Place two or three lumps of cyanide of potassium, of the size of beans, in a wide-mouthed bottle, pour in sufficient water to cover the lumps, and add enough plaster of paris to take up the water. If the bottle is left uncorked for a short time, the plaster will rapidly set and harden. Care should be taken not to inhale the poisonous fumes which come from this bottle, nor to leave the cork out for any length of time, for the cyanide would soon be lost through the escape of the fumes. It is often desirable to place a circle of thick blotting paper on the surface of the plaster to absorb any moisture which may form.

Insect Pins.—Insect pins do not readily rust when placed through the bodies of insects. Probably the best are the black japanned kind. The most desirable pins for the ordinary work of the collector of insects are **Nos. 1, 3, 5,**—No. 1 being suitable for small insects, No. 3 for insects of medium size, and No. 5 for insects with large bodies. German steel mourning pins with glass heads are second best, and may be had at any dry-goods store. Common pins should not be used. Care should be taken when pinning insects to thrust the pin through two-thirds the length, so that from one-third to one-quarter of the pin projects above the back of the insect. The beetles should be pinned through the right wing cover; other insects through the thorax, or that part of the body just back of the head.

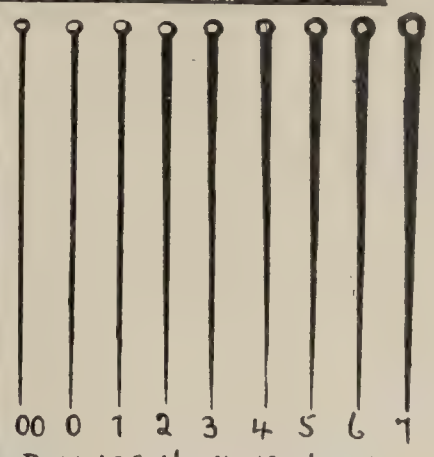
Insect Net.—A handy boy can readily make an insect net for himself. All that he requires is a broom handle, three feet of stout wire, a little heavy cotton sheeting, and one yard of cheese cloth or mosquito netting. The wire can be bent into a circle of about ten inches in diameter and the ends fastened firmly into the end of the broom handle. The cheese cloth is made into a bag and attached to the band of sheeting which folds over the wire.

INSECT NET



INSECT KILLING BOTTLE

STANDARD INSECT PINS



PINS ARE 1½ INCHES LONG.
SIZES 3, 4 & 5 ARE MOST USED.

INSECT SPREADING BOARD

IN SPREADING THE WINGS INSERT THE PIN POINTS BEHIND THE VEINS.

DO NOT PUT THE PINS THROUGH THE WINGS HERE. INSERT THEM AT THE WING EDGES.

I

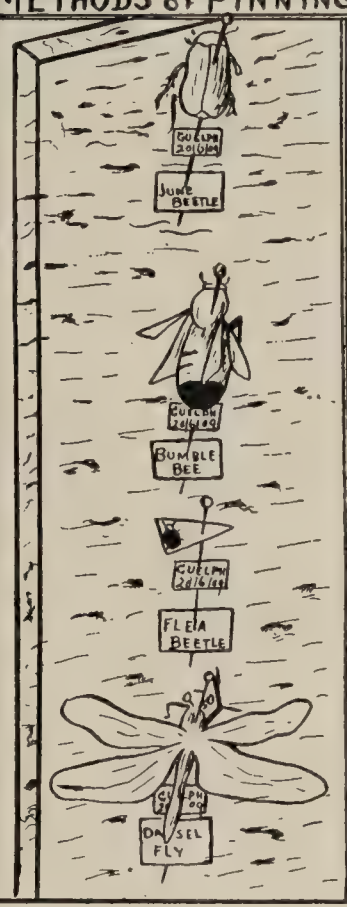
BUTTERFLY'S WINGS SPREAD AND HELD IN POSITION WITH MOURNING PINS.

II

STRIPS OF STIFF PAPER SET WITH THREE PINS HOLD WINGS IN PLACE UNTIL DRY AND SET.

LOCUSTS MAY HAVE THE WINGS OF ONE SIDE ONLY SPREAD

METHODS of PINNING AND LABELLING



BEETLES ARE PINNED THROUGH THE RIGHT WING COVER AT A SLIGHT SLANT.

HAVE ALL INSECTS AT THE SAME HEIGHT ON THE PINS, ABOUT ONE QUARTER OF PIN PROJECTING.

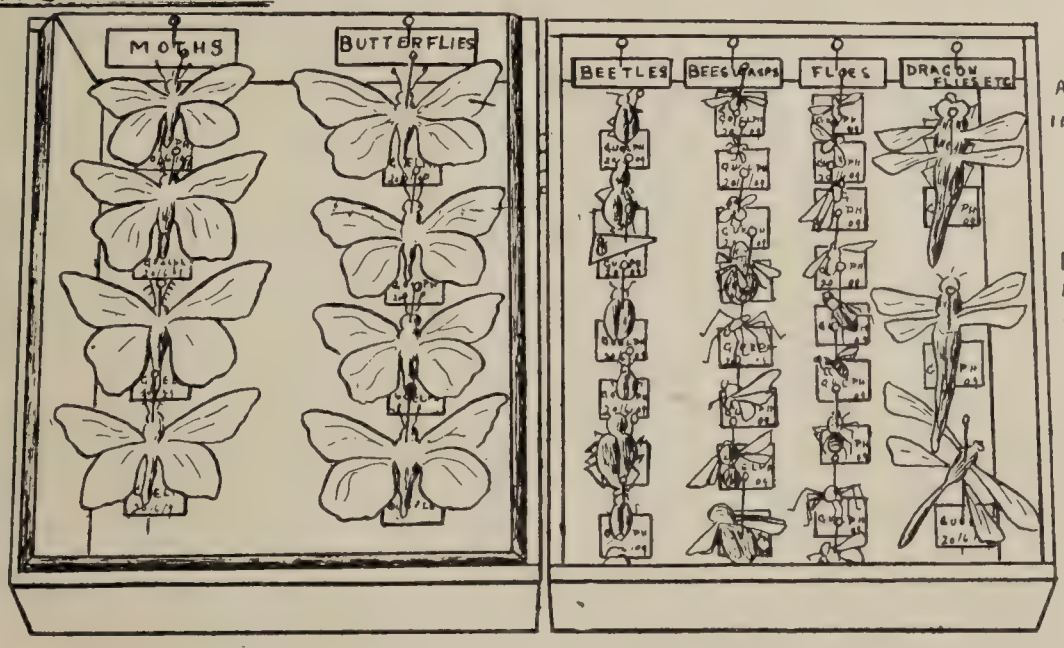
BEES, FLIES ETC ARE PINNED THROUGH THE THORAX.

SHEET OR PRESSED CORK IS THE BEST THING TO HOLD THE PINS.

SMALL INSECTS SHOULD BE GLUED TO A TRIANGULAR CARD.

THERE SHOULD BE TWO LABELS. THE SMALL UPPER ONE GIVING THE PLACE AND DATE OF COLLECTING THE LARGER LOWER ONE THE NAME OF THE INSECT

INSECT BOX



ARRANGE SPECIMENS IN GROUPS.

EXAMINE COLLECTIONS FREQUENTLY FOR ATTACKS BY PESTS.

CIGAR BOXES LINED WITH SHEET CORK ARE GOOD FOR SMALL COLLECTIONS.

GOOD MUSEUM MOUNTS CAN BE PREPARED BY PLACING SPECIMENS ON A PLAQUE OF PLASTER OF PARIS, COVERING WITH GLASS AND PASSE-PARTOUTING, OR USING GLASS COVERED BOXES WITH BATTING.

The collector will be a little awkward at first in the use of the insect net, but with practice the wiliest and most rapid of insects may be captured. Care is needed in transferring the insects from the net to the cyanide bottles lest the wings and legs should be injured.

Moths and butterflies when captured seldom die with their wings outspread, so it is necessary to use spreading boards for those forms which we desire to preserve in this position. The diagrams show the construction and use of a spreading board. Two pieces of pine, fastened together by cleats at the end, are left wide enough apart to admit the body of the insect. Narrow strips of cork are then tacked on the under side of the pine strips so as to form a bottom to the groove and to serve as a support for the pin upon which the insect is placed. Another broad strip is nailed to the cleats and forms the base of the spreading board. Of course the insects must be pinned to the spreading board before they have time to become brittle, and while they are in a relaxed condition. It will require some patience and skill to spread the wings of the smaller moths without injuring them, but practice will make perfect. Should the insects become dry, their muscles may be relaxed by putting them in a *moist chamber*; a gem jar with damp sand in the bottom will suffice. It will take a week or ten days for the drying. If they are removed before being completely dried the wings will sag. The dryness may be estimated by the rigidity of the body. Fine lines across the board enable one to spread neatly.

Insect Box.—Cases are necessary for holding and displaying the insects captured. At first the collector may use cigar boxes very satisfactorily, but the time will come when he will not be satisfied with anything less than good insect cases, which will keep out dust and minute insect pests. The bottoms of these should be lined with sheet cork, which can be purchased from dealers in insect supplies, or with bottle wrappers obtained from druggists. For exhibition purposes insect cases should have glass covers, if possible. Collectors who wish to make their collections look tidy, neat and artistic may line their cases with fine, glossy white paper. This improves very much the appearance of the collection as a whole.

Every specimen which has been placed in a collection should have a *date and locality* label and a *name* label attached. These labels may be written free hand or they may be printed with pen and ink. Printed labels, as a rule, look much better than written ones. The proper time to place date and locality label upon the insect is at the time of pinning, and it is usually placed below the insect about a third of the way up the pin. The name label is placed near the bottom of the pin.

Keeping Larvae.—For the preservation of the larvæ of insects, much may be said. It is important that collectors should preserve the larval forms as well as the other stages of the insect, for it should be borne in mind that those collections are of the highest value educationally which show the life history of the insect in all stages—the egg, the larva, the pupa and the adult. The larval stage of the insect, moreover, should be carefully preserved throughout all its molts, for the mature larva frequently differs considerably from the younger forms. Some collectors place the larvæ in liquid in vials; others prefer to inflate them and have them placed on pins beside the adult forms. For school purposes, however, the vials are to be preferred.

A good preserving liquid may be made as follows: 50 parts methylated alcohol, 50 parts water, 4 parts formalin. This mixture can be prepared by any druggist at a cost of about 25 cents per pint. It must be kept closely corked, as it evaporates very readily. Special bottles with bent necks are very suitable, but rather expensive, costing about 5 cents each. Two-drachm homœopathic vials with wide mouths may be obtained from druggists at much lower rates and will answer very well.

IV—HISTORICAL AND MISCELLANEOUS COLLECTIONS

Lest We Forget.—Objects that link the past to the present are of great educational interest and value. Such things are found in every neighborhood, and the school is the proper place for their keeping and interpretation. The boy who has picked up an ancient arrowhead or pipe from the site of some long-forgotten village may well feel a personal interest in the early exploits of Huron and Iroquois. But we need not go back to Indian times for relics of the past. The early pioneers of our own race have disappeared, too, and their primitive weapons, tools, and manufactures are hardly known to the children of to-day.

How much true history would be suggested by a few articles from a settler's outfit of one hundred years ago? The flint-lock musket, and the smooth hollowed stone used for grinding grain by hand, are almost as far removed from the present as are the tomahawk and the bow-and-arrow. Those who possess such relics would often be glad to place them where they could be assured of permanent care and usefulness to successive generations of children.

What are these? Who made them?

Articles of this class should be carefully numbered and described in a note-book or by means of tickets securely fastened to them.

Small objects are best fastened on cards in the same way as specimens of wood described on page 9.

Such a collection needs little care or preparation, and if properly used will be both interesting and instructive.

What could be more interesting for the School Fair held in September or the School Reception held in December than bringing together for public

exhibition some of the old-fashioned things cherished in the homes of the neighborhood? And how interesting it would be to hear some of the old pioneers tell of the early days when they used the tallow-dips, the spinning wheel, the flail, the oxen's neck-yoke, the home-made fork, the old square lantern lighted with the candle! And what a guessing contest the old photographs would make! Perhaps some of these valuable old things might be donated to the school museum or given for a wall adornment.

There are many things not mentioned previously that might find a place in a good school collection of natural objects. Such are specimens of the work of animals: birds, insects, squirrels, etc. The wasps were the first pulp and paper makers, just as the beavers were carpenters and architects and the birds weavers and masons. This work is worthy of careful study and can be easily kept in a school-room.

Egg Collections Should Be Discouraged.—Boys often collect birds' eggs, but this is a destructive practice and should be discouraged in every way in the making of children's collections. A careful description of a nest and its eggs, with dates of building, hatching and flying in the Nature Notes of the school-room is far better than the ruined home with its empty shells. It should be known also that the destruction of beneficial birds or their eggs is an offence punishable by fine or imprisonment. In this way the law recognizes the value of the birds in destroying insect enemies of farm and orchard, and in entertaining us by their songs.

There is one bird, however, that deserves no such protection. It builds no nest at all, but lays its eggs along with those of one of its neighbors, where it hatches out and bullies the honest nestlings, often causing their death. When such an egg is found in a nest it should be destroyed for the sake of the others. This is the cowbird.

Mineral Collections.—In many places very good local collections of rocks and minerals may be made. These should be ticketed or labelled so that their names and localities may be readily seen, and in the case of useful minerals the composition should also be stated in some simple way. For instance, magnetic iron ore might be shown as containing nearly three-fourths of its weight of iron, or crystalline marble as merely a form of limestone.

Stones or pebbles which show the action of natural forces like frost, running water, etc., have an interest and a use without regard to the materials which they contain. Specimens of fossil animals or plants are of great value as illustrating the simple world history, now taught in connection with physical geography.

Collections of Nature Pictures.—Besides the actual objects as here described, representations such as pictures, drawings, water-color paintings and photographs from nature are all valuable additions and can be used to beautify the school-room as well as to improve the minds of the pupils. Scholars should be encouraged to draw simple natural objects, and the best work should become a part of the school collection. This is one means of cultivating the natural fondness for expression by drawing and coloring which has been too little helped by our schools.

V—BULLETIN BOARD AND MUSEUM CABINET

A school bulletin board will be found very useful in connection with Nature Study and Agriculture. For schools taking up Agriculture systematically under the plans proposed by the Department of Education in their regulations, this aid to teaching the subject is especially recommended. The board should not be too high from the floor, so that the smaller pupils may use it conveniently. It may be made by stretching a piece of burlap about 4 ft. long and 3 ft. wide on the wall and fixing the edges with neat picture-frame border. On this objects of interest can be displayed to advantage—the new weed, the old bird's nest, the stray bird's feather, the diseased plant, the insect's work, the best mounted plant, clippings from papers relating to Nature or Agriculture, lesson charts on Agriculture, pictures of animals, plans of barns, announcements of the School Progress Club programme, the topic for next Friday's debate, the bird and flower charts, the best drawings, some of the best compositions, the programme for the Field Day, the competitions for the School Fair—all these things should be made known to the whole school by means of the bulletin board. It may be made a very lively centre of interest and instruction.

Agricultural Book Shelf.—At the bottom or at the side of the bulletin board there should be a shelf to hold all the working books on Nature Study and Agriculture. One of the agricultural papers or magazines might be subscribed for. All the agricultural bulletins and reports and a few good books should be within reach of the pupils. And teachers could teach no better agriculture than to lead pupils to read and inquire for themselves.

Museum Cabinet.—In most schools it is not possible to have collections kept in glass museum cases, even if it were thought desirable. Neither is it wise nor practicable to keep exhibits about the walls. A well-made dust-proof cabinet is desirable. It might be made on the "unit" system used in modern library building, to commence with a unit of about six drawers, and others added as required. One set of drawers could be used for pictures and photos, another for pressed plants, another for rocks and minerals, others for insects, bird skins, Indian relics, seeds, grains, etc. Such a collection would often be of use in the school work. The drawers should be proportioned so as to use a size to fit the herbarium mounts (11½ x 16½ in.) as a unit. Collections that are no use or that cannot be used should have no room in a school. And as previously stated, it should be remembered always that it is not in *having* a collection but in *making* and *using* a collection that the good lies.

VI—SCHOOL FAIRS AND CHILDREN'S COMPETITIONS

In the 1906 edition of this bulletin, prize lists for children's competitions were published, showing how the Fair authorities at Simcoe, Guelph, London and Toronto encouraged an interest in children's work and collections.

Since that date there has been considerable increase throughout the Province in children's competitions arranged by Agricultural or Horticultural Societies. The Agricultural Representatives also have promoted competitions amongst school children in several counties and held many successful Rural School Fairs and Corn Shows.

Below will be found lists embodying suggestive competitions such as may be carried out for Fall Fairs or Rural School Fairs. The number of competitions to be arranged for will depend on the number of children likely to compete. As a rule it will be better to keep the number of competitions small rather than large.

Danger in Competitions.—It is hardly necessary to call attention here to a danger of turning a proper educational factor into an improper and harmful scramble for prize money. Teachers should guard themselves and their pupils against it. Nature collections that have been made or garden work that has been carried on solely for exhibition purposes should be condemned. If the work has been done in the natural course of school work and from a natural, healthy impulse to acquaint oneself with nature's forms and to fix the knowledge in a display, well and good.

Suitable Prizes.—Perhaps many small prizes would be better than a few large ones. Extensive and elaborate collections should not be given undue credit over the smaller and simpler. One of the chief aims of the judges should be to give a general stimulus to this branch of school study, and the small child and the simple effort should not be lost sight of. Instead of a few generous money prizes for each competition, it may be considered better to give smaller prizes of useful articles to all deserving competitors; books, bulbs, subscriptions to magazines, rose bushes, apple trees, pictures, and such things, will in many cases bring better educational returns than money.

Children's Exhibits in Oat Competition, Provincial Winter Fair, Guelph, 1912.

Competitions in Nature Collections for a Fall Fair.—The Central Exhibition, held at Guelph, always has good school exhibits in Writing and Drawing, Domestic Science, Manual Training and Nature Study. The regulations governing the nature collections are:—

1. The prizes are offered to encourage Nature Study in the public and separate schools. The teacher must certify that the collections have been made in connection with the school work by the co-operation of the pupils, or by an individual pupil, and must have been done since last Exhibition.

2. Each exhibit must show plainly the name and place of the school, and the name of the teacher.

3. The preparation of exhibits should be as nearly as possible according to directions given in the HINTS ON NATURE COLLECTIONS, that is, in this bulletin.

Prize List.—1. Collection of wild plants and flowers, picked and pressed while in bloom and showing root; mounted, and correctly named.

2. Collection of noxious weeds, pressed and mounted.

3. Collection of seeds of noxious weeds, in glass vials, mounted on cards—vials not necessarily full.

4. Collection of grains in the head, 5 heads of each variety, stems about 12 inches in length, supported on cards.

5. Collection of grasses and clovers, 5 stems of each as in section 4.

6. Collection of leaves or twigs of cultivated or forest trees.

7. Collection of native woods, showing bark and surfaces. Each specimen not to be more than 5 inches in length.

8. Collection of insects, injurious or beneficial.

9. Collection of noxious weeds, newly pulled, each bearing a label or tag with name and locality. Specimens should show the complete plant, with flowers and fruit, if possible, but care must be taken not to scatter seeds by means of any of these exhibits.

10. Bouquet of cut flowers grown on school grounds or in schoolhouse.

11. Drawing of a plant, bird and insect, grouped, if possible, by a pupil of the school.

12. Photographs of natural scenery, by a pupil of the school.

13. Naming competition open to individual pupils of the public or separate schools. This will include the naming and discussion of several varieties of apples, grains, weeds, wild flowers, birds or other common outdoor objects.

14. A collection of nature notes kept in the school by the teacher and pupils, and showing interesting events from day to day in the outdoor world. Such may include the arrival, nesting, and food of birds, the opening of flowers, and appearance of insects, the leafing of trees, the sowing and planting of crops, the blossoming of fruit trees, the occurrence of storms or floods, and any similar items of interest. These should be written, as far as possible, by the pupils themselves, under the teacher's guidance, and should give date, place and all necessary details over the signature of the observer. A neat scribbling-book, written in pencil, will be satisfactory for this purpose. It will be judged for neatness, completeness, and accuracy. This would require only a few minutes at a set time each day, say the first thing in the morning, and would be a splendid exercise in training the observation.

15. The best arranged exhibit of roots, vegetables, and grain by the teacher and pupils of a public school section.

NOTE.—Competition 13, in naming nature objects is specially commended.

Master Gerald Anderson and his Prize Winning Colt,
Ameliasburg Rural School Fall Fair, 1912.

Competitions for Rural School Fair.—The lists printed below show the competitions carried out in 1912 by the Agricultural Representative in Prince Edward County. It represents in general the line of work covered in other counties where representatives are located. The competitions were restricted to the schools of the township of Ameliasburg. The prizes were money and ribbons.

Such a large fair would be impossible and undesirable if it had to be carried out alone by the teacher of a one-teacher rural school. But within the list there will be found suggestions for a few competitions that might be arranged for any school that cannot have help from a representative. The varieties of corn, potatoes and grains would probably require adjusting differently for other places.

PRIZE LIST OF RURAL SCHOOL FAIR

HELD AT

AMELIASBURG, SEPTEMBER 20TH, 1912.

RULES.

1. Competition for these prizes is open only to School Pupils of Ameliasburg Township.

2. No entry fee will be charged.

3. All pupils taking seed and planting same must exhibit their produce in the class to which it belongs.

4. All exhibits must be the work of and property of the exhibitor.

5. All exhibits of grain, potatoes, and corn must be the product of the seed supplied by the Department.

6. Send all entries to your teacher at least one week before the date of the Fair.

7. All exhibits must be in place not later than 10.30 a.m. on the date of the Fair, as judging will begin at that time.

PRIZE LIST.

CLASS I.—BANNER OATS.—Sec. 1. Sheaf of selected plants from plots (about 2½ in. diameter). Sec. 2. ½ Peck Banner Oats, selected from plot.

CLASS II.—O. A. C. No. 21 BARLEY.—Sec. 1. Sheaf of selected Plants, from plots (about 2½ in. diameter). Sec. 2. ½ Peck O. A. C. No. 21 Barley, selected from plots.

CLASS III.—EARLY OHIO POTATOES.—Sec. 1. Best Ten Potatoes, selected from plots.

CLASS IV.—LATE POTATOES—DELAWARE.—Sec. 1. Best Ten Potatoes, selected from plots.

CLASS V.—GOLDEN BANTAM SWEET CORN.—Sec. 1. Best Ten Ears, selected from plots. Sec. 2. Sheaf of Six Selected Plants.

CLASS VI.—ENSILAGE CORN—WHITE CAP.—Sec. 1. Sheaf of Ten Selected Plants. Sec. 2. Best Ten Ears, selected from plots.

CLASS VII.—FLINT CORN—COMPTON'S EARLY.—Sec. 1. Best Ten Ears, selected from plots. Sec. 2. Best Sheaf of Ten Selected Plants.

CLASS VIII.—Open to Pupils in Form Senior III. and upwards. Sec. 1. Essay on "Potatoes." Sec. 2. Essay on "Corn." Sec. 2. Essay on "Oats." Sec. 4. Essay on "Barley."

CLASS IX.—Open to Pupils in Forms below Senior III. Sec. 1. Essay, "How I Grew My Plot of Potatoes." Sec. 2. Essay, "How I Grew My Plot of Corn." Sec. 3. Essay, "How I Grew My Plot of Oats." Sec. 4. Essay, "How I Grew My Plot of Barley."

CLASS X.—Sec. 1. Collection of Twenty Injurious Weeds, pressed, mounted and correctly named. Sec. 2. Collection of Injurious Insects, correctly named. Sec. 3. Collection of Work of Insects and Plant Diseases, correctly named. Sec. 4. Collection of Weed Seeds, correctly named. Sec. 5. Collection of Apples, two of each variety, correctly named. Sec. 5. Collection of Pears, two of each variety, correctly named.

CLASS XI.—LIVE STOCK.—Sec. 1. Colt, heavy, foaled after March 1st, 1912. Must be the property of exhibitor. Sec. 2. Colt, light, foaled after March 1st, 1912. Must be the property of exhibitor.

R. E. WRIGHT, SPECIAL $5.00.—APPLE NAMING CONTEST.—Open to all school pupils. Two prizes will be given, one amounting to $3.00 to the boy or girl naming the largest number of varieties of apples, and a second prize of $2.00 to the boy or girl naming the second largest number of apples.

SPECIALS.—Best Kept Plot in each School section. School securing the highest number of first prizes. Special prizes to be announced later.

Ontario Department of Education

Publications Relating to Elementary Agriculture, School Ground Improvement, Etc.

Copies of these publications have been sent to all the schools, and teachers should see that they are retained in the schools for the use of teachers, trustees, or pupils. So far as the supply will admit of it, additional copies are sent to teachers or others requesting the same for personal use. Some of the circulars are for pupils' use; additional copies of these are furnished free to teachers who make use of them in the classes. Address Director of Elementary Agricultural Education, Ontario Agricultural College, Guelph.

Circulars and Charts

	1908	Improvement of School Grounds.
	1909	Plans for Rural School Buildings.
Circular 13,	1912	Regulations Relating to Elementary Agriculture and Horticulture in School Gardens, with a survey of the Work in Ontario in 1911.
Circular 13A	1912	Children's Gardening. (*For Pupils*)
Circular 13B	1913	Spring and Summer Courses for Teachers at the Ontario Agricultural College, Guelph.
Circular 13D	1912	Alfalfa or Lucerne. (*For Pupils*)
Chart No. 1	1912	Alfalfa or Lucerne.
Circular 13E	1912	On the Best Time to Sow Spring Grains. (*For Pupils*)
Chart No. 2	1912	On the Best Time to Sow Spring Grains.

Agricultural Education Bulletins

No. 1,	Jan. 1913	The Story of an Ontario School Garden.
No. 2,	Jan. 1913	Agriculture in the Schools of Ontario.
No. 3,	Feb. 1913	Suggestions and Helps for Teaching Agriculture and Carrying on School Gardening.
No. 4,	Mar. 1913	The Dominion Agricultural Instruction Act, etc.
No. 5,	Mar. 1913	The Carleton County Potato-Growing Contest, 1912
No. 6,	Apr. 1913	School Improvement and Arbor Day.
No. 7,	May 1913	Signs of Progress in 1913.
No. 8,	June 1913	Nature Collections for Schools.

Instruction Sheets

In addition to the circulars, bulletins, and charts, listed above, the *Schools' Division of the Experimental Union* sends *Instruction Sheets* with the planting material sent out for school gardening purposes. Additional copies of these are sent free for pupils' use.

No. 1,	1912	School Experiment with Lettuce.
No. 2,	1912	School Experiment with Onions.
No. 3,	1913	School Experiment with Beets.
No. 4,	1913	School Gardening Experiments and Demonstrations.
No. 5,	1913	School Progress Club Organizations and Instructions for Canning for Girls' Canning Clubs.
No. 6,	1913	Corn Clubs for Ontario Schools.

NOTE.—These *Agricultural Education Bulletins* are addressed in accordance with the school addresses furnished by School Inspectors, as follows:—

To THE TEACHER,

S. S. No. 1 Esquesing Tp.,

MANSEWOOD P.O.,

HALTON CO. ONT.

Teachers who are not receiving copies regularly should make inquiries of postmasters or rural route mail carriers. If the back numbers cannot be traced, please report to the *Director of Elementary Agricultural Education, Ontario Agricultural College, Guelph.*